ICT 2206 – Internet Programming

Individual Project – Second Submission

Title: **Design and Implement a Network Infrastructure with VLANs, DHCP Servers, Firewalls, and Internet Connectivity**

Objective:

Design a network for a mid-sized company using Cisco Packet Tracer. The project requires the implementation of VLANs for department separation, DHCP servers for automatic IP assignment, a firewall for network security, and internet connectivity for external communication.

Intended Learning Outcomes:

By completing this project, you will demonstrate skills in VLAN configuration, inter-VLAN routing, dynamic IP address assignment, firewall setup, and basic internet connectivity for an enterprise network.

Scenario:

You are a network administrator for a company that has *n* user departments, *m* administrative departments, *p* academic departments, and 1 security and emergency response department. Each department must be assigned to its own VLAN for logical separation and security. The company also requires dynamic IP address assignment using DHCP, with a single DHCP server with VLAN interfaces for the internal networks.

Network Requirements:

1. **Departments (VLANs)**:
    - Each VLAN should be assigned numbers in the range of 10, 20, 30, …
    - Each VLAN should be assigned separate /24 address ranges from any private IP address ranges you like.
2. **Devices**:
    - Each VLAN should be serviced with a separate Layer 2 switch
    - 1 Router (Layer 3, configured as a gateway and firewall)
    - 1 Internet Cloud (Simulated internet access)

- 1 DHCP server with VLAN interfaces
- At least 3 PCs for each department

3. **DHCP Configuration**:
    - For each VLAN, the upper half of the allocated address range should be provided through DHCP.
4. **Internet Connectivity**:
    - Connect the router to an ISP via the internet cloud (use simulated connectivity).

Changes in the Scenario for the Second Submission:

You must configure a firewall to secure the entire network and allow selective internet access. Additionally, three computers should be allocated for guest access in each user department so that visitors can access the services the relevant department provides. These three computers should be allocated the last three statically allocated IP addresses for each department. These computers are only allowed to access the services available in the department (no access to the internet or outside the respective VLAN).

Network Requirements:

1. **Departments (VLANs)**:
    - No change.
2. **Devices**:
    - Additional 3 PCs for each department with static IP addresses
3. **DHCP Configuration**:
    - No change
4. **Firewall**:
    - Permit internet access for all VLANs.
    - Block external access to internal networks.
    - Block the newly added PCs from accessing outside the VLAN.
5. **Internet Connectivity**:
    - No change.

Tasks to Complete for Submission 02:

1. **Network Topology Design**:
    - No change.
2. **VLAN Configuration**:
    - No change.
3. **Router Configuration**:
    - No change.
4. **DHCP Server Setup**:
    - No change.
5. **Firewall Configuration**:
    - Configure access control lists (ACLs) on the router to act as a firewall.
    - Allow all VLANs to access the internet.
    - Deny external (internet) access to the internal network.
    - Deny the newly added PCs any access outside the relevant VLAN.
6. **Internet Connectivity**:
    - No change.
7. **Testing and Verification**:
    - Ensure that devices in each VLAN can communicate with each other and access the internet.
    - Ensure that the newly added PCs in each VLAN can communicate only with other PCs in the same VLAN.
8. **Documentation**:
    - Document all configurations (commands) for the firewall and the complete set of firewall rules.

Submission Requirements:

- Packet Tracer Project File (.pkt)
- Text file containing all configurations (commands) for the firewall and the complete set of firewall rules

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